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6/21/05-02519

21 June 2005

Mr. Stacin Martin
CH2M Hill
5700 Cleveland Street, Suite 101
Westmoreland Building
Virginia Beach, VA 33462

RE: Letter Report for the 400 Acre Flora and Fauna Survey, Vieques, Puerto Rico under Navy CLEAN III Program, Contract Number N62470-02-D-3052; PO Number 908165

Dr. Mr. Martin:

Geo-Marine, Inc. (GMI) was contracted by CH2M Hill to conduct a 400 acre (ac) flora survey, with 100% coverage, on the former Vieques Naval Training Range (VNTR) on Vieques, Puerto Rico. The purpose of the flora survey was to identify endangered, threatened, critical, sensitive species or new species within the 400 ac on the former VNTR. In addition to the 400 ac flora survey, CH2M Hill requested GMI perform a roseate tern (*Sterna dougallii*) and least tern (*Sterna antillarum*) survey to identify potential habitat and nesting occurrence, concurrently with the flora survey, within the 400 ac former VNTR.

GMI staff and contract personnel conducted 100% coverage surveys for federal and state endangered, threatened, critical, sensitive species or new species, the roseate tern, and the least tern. The team participating in the survey was trained in plant and bird species identification before beginning the surveys. Flora and fauna surveys were conducted for 11 days from May 11, 2005 through May 25, 2005. During this period three to four biologist were involved in the daily surveys.

The floral, roseate tern, and least turn surveys began in the northwest corner of the Live Impact Area (LIA) and proceeded south and eastward based on 35 transects GMI established. Each transect was 200 feet (ft) wide, numbered 1 through 27 and 20a through 27a, ran north to south, and from coast to coast (**Figure 1**). Each 200 ft transect line had a corresponding GPS point. The observers walked parallel transects about 50 ft apart to survey the area and provide 100% coverage. Dense vegetation and rugged terrain required walking slowly with frequent stops to clear a path, observe surrounding vegetation, and monitor bird activity. Uniform pedestrian surveys coverage of the coastal area, mangroves, and along the quebradas was attempted; however, observers occasionally deviated from the transect lines.

Endangered, Threatened, Critical, or Sensitive Plant Species

Several terrestrial plant species that could potentially occur on Vieques are federally listed as protected by U.S. Fish and Wildlife Service (USFWS). The four endangered plant species of primary concern occurring on Vieques are Thomas' lidflower (*Calyptranthes thomasiana*), *Chamaecrista glandulosa* var. *mirabilis*, and *Eugenia woodburyana* (USFWS 2005). The threatened plant species is cobana negra (*Stahlia monosperma*). Beautiful goetzea (*Goetzea elegans*) had not previously been recorded on Vieques; however, seven locations for the plants were found during GMI's September 2000 surveys along the quebradas on the western end of Vieques. Due to the lack of appropriate habitat it is highly unlikely that beautiful goetzea would occur in the LIA.

Thomas' lidflower is a small evergreen tree/shrub in the Myrtaceae (myrtle) family. Thomas' lidflower is normally found in the moist deciduous formation of the inner hills and slopes that include semi-evergreen forests. This forest type is characterized by trees that are 10 to 15 m (30 to 45 ft) in height, of which one-third to one-half are deciduous. A lower strata with epiphytic orchids and vines is present. The most common species in this forest type is the palm tree (*Coccothrinax argentea*) (USFWS 1997). This plant

may reach 30 ft (9 m) in height and 5 inches (13 centimeters [cm]) in diameter. Its leaves are opposite, obovate to oblong, blunt at the apex, and short pointed at the base. The leaves are shiny on the upper surface, and dull on the lower surface, and have gland dots. Flower buds are obovoid, apiculate and 0.1 inches (3 mm) long while the flowers have four small, spatulate petals. The fruit has not been described (USFWS 1997).

It is unlikely that Thomas' lidflower would occur in the LIA due to lack of the appropriate habitat. Thomas' lidflower is reported to grow within dense semi-evergreen forests on mountains at 300 ft to 800 ft (91 to 244 meters) altitude (Little and Woodbury 1980). The highest altitude at the former VNTR is 453 ft (138 meters) at Monte Jalobra—formerly Observation Post-1 [OP-1]). The habitat at Monte Pirata on the western side of the island is more suitable for this plant and 10 to 12 plants have been reported as occurring there (USFWS 1989). During the May 2005, 400 ac surveys, GMI did not locate any of this species within the LIA.

Chamaecrista glandulosa was listed as endangered in 1990 and is extremely rare within its range. This small legume/shrub is endemic to white silica sands along the northern coast of Puerto Rico. Once common, it now is restricted to one area in Dorado and one area in Vega Alta. Scattered populations are present along the southern shore of Laguna Tortuguero (USFWS 1994a). The sands where *Chamaecrista glandulosa* occurs on the north coast are between Vega Baja and Manatí at near sea level elevation. The soils belong to the Algarrobo-Corozo-Arecibo soil association, which are deep, excessively drained, fine sands. At Laguna Tortuguero, *Chamaecrista glandulosa* is found growing on almost pure sands, with no organic layer, and frequently in open areas. *Chamaecrista glandulosa* is a prostrate, ascending or erect shrub up to 3.3 ft (1 meter) in height. Its branches are slender, straight, and wire-like. The leaves are alternate, evenly one-pinnate, 0.4 to 1.2 inches (1 to 3 cm) long, 0.2 to 0.4 inches (0.5 to 1 cm) wide, and have some scattered whitish hairs. The stipules are persistent, striate, and about 0.8 inches (2 mm) long. The leaflets are mebranaceous, usually in 18 pairs, 0.1 to 0.2 in (3 to 6 mm) long and 0.02 to 0.06 inches (0.5 to 1.5 mm) wide. Its flowers are solitary and have a yellow corolla. Mature fruits (legumes) are flat and 1 to 1.6 inches (2.5 to 4 cm) long, with 12 to 15 seeds (USFWS 1994a).

Because *Chamaecrista glandulosa* var. *mirabilis* occurs in open, sandy areas, potential suitable habitat exists for this plant within the LIA. A historical record indicated that *Chamaecrista glandulosa* had been collected near Bahía Corcho by Dr. George Proctor; however, Bahía Corcho was intensively surveyed in 1996 for the plant and none were found (GMI 1997). In addition, GMI conducted surveys in 2000 along the south coast outside the LIA and along the western coast did not reveal any plants of this species. During the May 2005, 400 ac 100% coverage surveys, GMI did not locate any of this species within the LIA.

Eugenia woodburyana, no common name, is a small evergreen tree in the Myrtaceae family and is endemic to southwestern Puerto Rico. There are approximately 150 individuals known from a range of hills (Sierra Bermeja) in the municipalities of Cabo Rojo and Lajas, and from the Guánica Commonwealth Forest. *Eugenia woodburyana* was listed as an endangered species in 1994 (USFWS 1994b, 1998) and has been included in the Center for Plant Conservation's Report on Rare Plants in Puerto Rico as taxa, which may become extinct within the next 10 years. It is also considered to be a critical plant by the Natural Heritage Program of the Puerto Rico DNER (USFWS 1994b). *Eugenia woodburyana* is found in subtropical dry forest zones, which are either deciduous or semi-evergreen seasonal forests (Puerto Rico Conservation Foundation 1999; USFWS 1998). Extensive areas of this forest type overlie limestone. The deciduous forest consists of tree and shrub strata in which the trees may reach 33 ft (10 m) in height. Soils in the semi-evergreen forests retain greater moisture and the trees are somewhat taller (Puerto Rico Conservation Foundation 1999). Vegetation in the subtropical dry forest zone forms a complete ground cover, leaves are succulent, and spiny and thorny species are common. Trees are usually no more than 49 ft (15 meters) in height with crowns broad, spreading, and flattened. *Eugenia woodburyana* may reach 20 ft (6 meters) in height. The leaves are opposite, obovate, pilose on both sides, with glandular dots below, and from 0.6 to 0.8 inches (1.5 to 2 cm) long and 0.4 to 0.8 inches (1 to 1.5 cm) wide. The calyx is 4-lobed and the petals are white. The fruit at maturity is red, 8-winged, and 0.8 inches (2 cm) in diameter (USFWS 1998).

It is highly unlikely that *Eugenia woodburyana* would occur in the LIA due to the lack of appropriate habitat. If appropriate habitat were present, this plant would most likely occur on steep hillsides along the southern coast and central portions of the LIA, or along the quebradas in the north. Previous surveys have determined that this plant is not present along the southern coastal areas. In 1996, five *Eugenia woodburyana* individuals were observed on the steep, southwest slope of Monte Pirata on the western side of the island—the highest altitude in the former VNTR is 453 ft [138 m] at Monte Jalobra, the location of OP-1. During the May 2005, 400 ac surveys, GMI did not locate any of this species within the LIA.

Cobana negra was listed as threatened in 1990. This medium-sized evergreen tree of the legume family occurs in coastal woodlands of the eastern and southern districts of Puerto Rico, on Vieques, and on Hispaniola (Liogier 1999). The largest known population is in southwestern Puerto Rico near Boquerón and contains 23 mature trees and 35 seedlings. Cobana negra usually grows in brackish, seasonally flooded wetlands in association with mangroves. Its associates are ucar (*Bucida buceras*), black mangrove, white mangrove, and buttonwood. Plants are also found on pasturelands adjacent to mangrove forests. Nearly all of the known trees are growing at the edge of salt flats or shallow lagoons that are inundated during the wet season. Although cobana negra trees are usually found adjacent to black mangrove stands, they are limited to the drier, slightly elevated soil not occupied by mangroves (USFWS 1990). Cobana negra can reach 8 to 53 ft (2.4m to 16 m) in height and 1 to 1.6 ft (0.3 to 0.5 m) in diameter. The plant has pinnately compound, alternate leaves comprised of six to 12 opposite leaflets with scattered black dots or glands on the lower surface. Yellow flowers are produced between March and May. Fruits are approximately 0.8 inches to 1.2 inches (2 cm to 3 cm) in diameter and have a single, large seed surrounded by a red, fleshy covering. Seeds are normally dispersed by animals and germinate following burial and recession of surface water (USFWS 1995).

There are three known populations of cobana negra on Vieques totaling about 48 individuals. It is found on Vieques near Laguna Yanuel (Ensenada Honda) and Laguna Kiani, both Class I conservation zones (GMI 1996). The first site on the west side of the island in the conservation zone at Laguna Kiani has historically had one to three mature individuals of cobana negra. The trees are approximately 246 ft (75 m) away from the road in a transitional area between salt-sand flats and thick thorn scrub. Nearby vegetation consisted of bastard gregre (*Ginoria rohrii*), mesquite, acacias, black mangrove, and buttonwood (GMI 1997).

The second site consisting of approximately 18 individuals was reconfirmed at a location along the northwest shoreline. This population has been known about for sometime but has not been reported in the literature. The population occurs on the east end of a mangrove community at the edge of a dense forest in a transitional area between salt-sand flats and thick thorn scrub. It appears that these plants are offshoots from a mature plant that was blown down in a hurricane (probably Hugo). The plants are in several rows that radiate from the parent plant. No flowers or fruits were observed on any of the plants. The most common species near the cobana negra are Bastard gregre, mesquite, acacia trees (*Acacia farnesiana* and *Acacia macracantha*), black mangrove, buttonwood, and white mangrove (Wilkinson and Cubiñá 2000).

The third population located at Yanuel Laguna in the former VNTR is represented by at least 20 individuals. The site is in the transitional area between mangrove forest and the upland forest north of the Lagoon. Bastard gregre, a species associated with cobana negra around Laguna Kiani on western Vieques, also occurs in the upland forest of Laguna Yanuel. Other species present were buttonwood, mesquite, box brier, ucar, almacigo, black mampoo (*Guapira fragrans*), and caper tree (*Capparis flexuosa*).

With the verification of the population along the northwest shore of Vieques in September 2000, there are now three confirmed cobana negra sites found on Vieques, none of which are in the LIA. The total number of plants at the three locations is in excess of 48 individuals. However, the age structure of these populations is dominated by older individuals or by plants reproducing by vegetative propagation. No flowers, fruits, or young plants were observed at any of the three locations (Wilkinson and Cubiñá 2000).

Only a small area of potential habitat exists within the former VNTR. All potential habitats within the LIA has been searched on foot or by helicopter. Surveys conducted by GMI in November 2000, January 11-13, 2001, and May 11-25, 2005, found no plants present within the LIA.

Table 1 outlines the identified state and federal endangered, threatened, critical, sensitive species that were surveyed during May 2005.

Table 1.
Federal and State List Plants

Family Name	Scientific Name	Common Name	Status	
			Federal	State
Pteridaceae	*Adiantum vivesii*	Puerto Rico maidenhair		E
Cyatheaceae	*Alsophila amintae*	forest alsophila		E
Cyathea dryopteroides				E
Poaceae	*Aristida chaseae*	Chase's threeawn		E
Poaceae	*Aristida portoricensis*	pelos del diablo		E
Rhamnaceae	*Auerodendron pauciflorum*	turtlefat		E
Flacourtiaceae	*Banara vanderbiltii*	Vanderbilt's palo de ramon		E
Buxaceae	*Buxus vahlii*	Vahl's box		E
Verbenaceae	*Callicarpa ampla*	caparosa		E
Myrtaceae	*Calyptranthes thomasiana*	Thomas' lidflower	E	E
Fabaceae	*Chamaecrista glandulosa (L.)* var. *mirabilis*	Jamaican broom	E	E
Verbenaceae	*Cornutia obovata*	nigua		E
Orchidaceae	*Cranichis ricartii*	Puerto Rico helmet orchid		E
Bignoniaceae	*Crescentia portoricensis*	higuero de sierra		E
Thymelaeaceae	*Daphnopsis helleriana*	Heller's cieneguillo		E
Dryopteridaceae	*Elaphoglossum serpens*	cerro de punta jayuya		E
Myrtaceae	*Eugenia woodburyana*		E	
Solanaceae	*Goetzea elegans*	mata buey		E
Aquifoliaceae	*Ilex cookie*	te		E
Aquifoliaceae	*Ilex sintenisii*	Sintenis' holly		E
Orchidaceae	*Lepanthes eltoroensis*	Luquillo Mountain babyboot orchid		E
Cactaceae	*Leptocereus grantianus*	sebucan		E
Ericaceae	*Lyonia truncatavar. Proctorii*	Proctor's staggerbush		E
Rubiaceae	*Mitracarpus maxwelliae*	Maxwell's girdlepod		E
Rubiaceae	*Mitracarpus polycladus*	cana gorda girdlepod		E
Myrtaceae	*Myrcia paganii*	ausu		E
Icacinaceae	*Ottoschulzia rhodoxylon*	pincho palo de rosa		E
Piperaceae	*Peperomia wheeleri*	Wheeler's peperomia		E
Dryopteridaceae	*Polystichum calderonense*	Monte Guilarte hollyfern		E
Solanaceae	*Solanum drymophilum*	erubia		E
Fabaceae	*Stahlia monosperma*	cobana negra	T	
Styracaceae	*Styrax portoricensis*	palo de jazmin		E
Dryopteridaceae	*Tectaria estremeriana*	Puerto Rico halberd fern		E
Theaceae	*Ternstroemia luquillensis*	palo colorado		E
Theaceae	*Ternstroemia subsessilis*	el yunque colorado		E
Thelypteridaceae	*Thelypteris inabonensis*	cordillera maiden fern		E
Thelypteridaceae	*Thelypteris verecunda*	Barrio Charcas maiden fern		E
Thelypteridaceae	*Thelypteris yaucoensis*	Puerto Rico maiden fern		E
Meliaceae	*Trichilia triacantha*	bariaco		E
Asteraceae	*Vernonia proctori*	Proctor's ironweed		E
Rutaceae	*Zanthoxylum thomasianum*	St. Thomas pricklyash		E

Legend:
E = Endangered
T = Threatened

Source: USDA 2005; USFWS 2005

Roseate Tern

The roseate tern (*Sterna dougallii)* is uncommon to rare and local in the West Indies. Small breeding colonies are known to occur from the Bahamas south through the Greater Antilles. Roseate terns are primarily present in the West Indies from April to September. Roseate terns nest from May through July. Offshore cays are the preferred nesting habitat of roseate (Raffaele et al. 1998). After nesting roseate terns migrate to the South Atlantic Ocean to winter.

Roseate Tern Habitat Suitability

The project area does not include suitable breeding/nesting habitats (i.e., offshore cays) preferred by roseate tern. Nesting was documented on the Vieques eastern peninsula, within the conservation zone, Punta Este by Oscar Diaz and GMI in June/July 2001. This site is similar to a cay; largely surrounded by water.

Least Tern

The least tern subspecies that occurs in the West Indies, *Sterna antillarum antillarum*, is classified as a common, but a local breeding resident in the Bahamas, Greater Antilles, Cayman Islands, St. Martin, Antigua, and Barbuda. In the Virgin Islands, northeast of Vieques, the least tern is classified as an uncommon local breeder. Least tern is a migratory species that arrives in West Indies in May, nests, and leaves in August to winter south of the study area. Migratory least terns that breed in North American are the same subspecies as those that nest in the West Indies and migrate through the area in September (Raffaele et al. 1998).

The least tern nests in coastal areas, harbors, and lagoons. A scrape in the substrate serves as a nest site. Nesting habitats vary widely and include industrial sites, sand bars, spits with coral rubble, and dried mudflats (Raffaele et al. 1998).

Least Tern Habitat Suitability

Based on a review of aerial photography of the project area, both man-made and natural lagoons and coastal areas are present in the project area. Suitable habitat substrates for nesting and roosting least terns, and potential feeding areas are present within the project area. Potential nesting and roosting sites in the project area include an unnamed natural lagoon west of the old strafing range (**Figure 2**; Transect Line 0 1), a natural lagoon southeast of Bahia Salinas (**Figure 2**; Transect Line 90-130), and Laguna Amones, a manmade lagoon (**Figure 2**; Transect Line 15.5-21).

Laguna Amones provides the best and most extensive nesting habitat for the least tern. The lagoon west of the old strafing range provides good but limited area for nesting. The potential nesting habitat in the natural lagoon southeast of Bahia Salinas is very narrow and therefore provides only marginal nesting habitat. Water levels in the lagoons vary directly with rainfall. Dry conditions provide very good nesting habitat for the terns while wetter conditions decrease the suitability of the habitat for nesting. The amount of suitable habitat during the nesting season would be expected to vary with rainfall totals.

Plant, Roseate Tern, and Least Tern Survey Results

No federal or state endangered, threatened, critical, sensitive, or new plant species were found May 11-25, 2005, during the 400 ac flora survey.

Based on the lack of suitable habitat it is highly unlikely that Thomas' lid flower or *Eugenia woodburyana* would be found within the LIA because they usually occur on mountains at higher altitudes than are present on the eastern end of the island.

Previous surveys for *Chamaecrista glandulosa* have been conducted in part of the LIA and most of the southern coastal portion of the Eastern Maneuver Area. During the May 2005, 400 ac pedestrian survey no *Chamaecrista glandulosa* were found.

Cobana negra is the only plant on the endangered/threatened list that has been confirmed as occurring within the former VNTR. This population consists of over 20 cobana negra individuals at Laguna Yanuel

within a conservation zone on the southern coast. Based on the results of the May 2005 survey and former GMI wetland surveys conducted in April 2002, cobana negra is not found in the LIA.

No roseate terns were observed within the 400 ac during the May 11-25, 2005, survey.

One pair of least terns was observed roosting on a salt substrate in the lagoon west of the strafing range on May 11 (**Figure 3**; Grid Numbers J3F1H4, J3F1H5, J3F1H6, J3FI4, J3FI5, J3FI6). Three pairs of nesting least terns were observed at the northern end of Laguna Amones on May 18 (**Figure 3**; Grid Numbers J3J2E4 and J3J2E5, J3JF5, J3J2F4).

Mitigation

Since potential suitable nesting and roosting habitat for the least tern occurs at each of the identified lagoons (**Figure 2** and **Figure 3**) the most practical mitigation to protect the least tern is to restrict all range-cleaning activities within the boundaries of the lagoon west of the strafing range (Grid Numbers J3F1H4, J3F1H5, J3F1H6, J3FI4, J3FI5, J3FI6), Laguna Amones, and the lagoon southeast of Bahia Salinas to the months when the least tern is not present (October through April). A no activity buffet zone of 500 ft should be established around the lagoons during the least tern-nesting season (May through August).

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Figures 1, 2, and 3 will be provided as separate documents, because of their size, on GMI's FTP site for download. FTP download instructions will be provided by email. If you have any questions, or need additional information, please do not hesitate to contact me. I can be reach via email (ptrent@geo-marine.com) or telephone (972.423.5480.

Sincerely,

Paula D. Trent

Paula Trent
Project Manager

cc: John Tomik
Susana Struve
Chris Penney

Ref: 35000.32.01